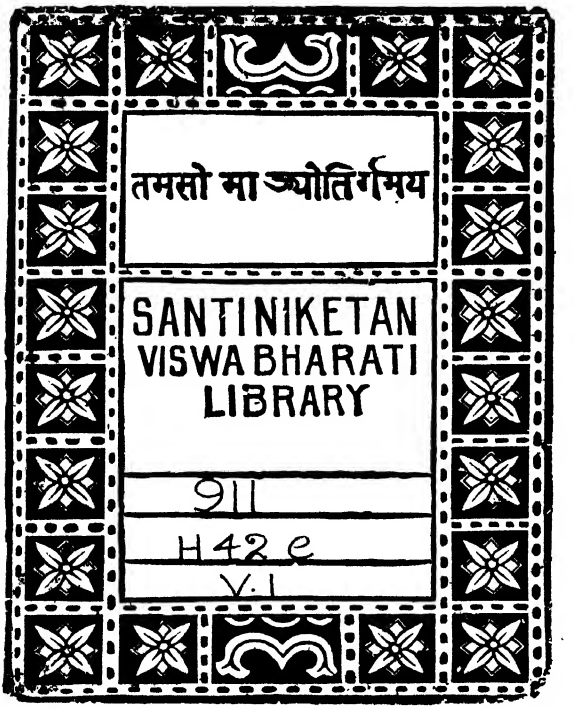
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THE OXFORD GEOGRAPHIES

EDITED BY A. J. HERBERTSON

THE ELEMENTARY GEOGRAPHY

VOLUME I

A FIRST PHYSIOGRAPHY

BY

F. D. HERBERTSON B.A. LONDON

WITH 23 ILLUSTRATIONS

NEW AND ENLARGED EDITION

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PREFACE

In this series the writer has tried to handle very simple matter in such a way as to make the geographical work of young children serve as a sound foundation for advanced work. She hopes that children who have worked through two or three volumes of this new series (the Oxford Elementary Geographies) will pass without difficulty to the more advanced series.

It is hoped that teachers will never forget that the exercises are an essential part of the book. They should be worked through by every pupil using it. Additional exercises will be found in Mr. Unstead's *Practical Geography*, published by the Clarendon Press.

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Oxford, *June*, 1911.

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LIST OF ILLUSTRATIONS

CHAPTER I

THE EARTH

1. As soon as a baby is born it begins to learn something of the world. The first thing it notices is the light. This learning goes on all our life. Small children know more about the world than the baby. Yet they know only a small piece of the world, the few walks round their homes. Bigger children may know the country for a few miles. Now and then they perhaps go by train for longer distances. In this way the world is always getting larger for us. Still we shall never see it all with our own eyes. Most of it we shall know only from pictures, books, and maps.

2. The Earth is shaped like a Ball. It is difficult to believe that our world is shaped like a ball. The small part we know shows no curve. Yet men have sailed on and on over the sea, without ever turning back, and have found themselves at last where they started. A flat earth would end somewhere. This is one reason why the Earth is said to be round. Sometimes we see its curved shadow hiding part of the moon. This is when there is an eclipse of the moon.

3. The Globe. The globe is a model of our Earth. You will often have to use it in learning geography. Look at the globe which your teacher shows you. You will be shown the two poles and the equator. When you have seen these on the globe you will understand what these names mean better than from any words.

4. The equator measures the greatest possible distance round the globe, where it bulges out midway between the two poles. Other circles are shown on the globe, each keeping the same distance from the equator all the way round. Measure the equator and any other circle with a string. You will find that the second circle is smaller than the equator. You will also find that such circles get smaller and smaller as you draw them farther from the equator and nearer to the pole.

5. Direction. Go through your house or through the school till you find a window which lets in the morning sun. On the opposite side of the house the windows will let in the evening sun. Go into the garden or playground and find which is the sunny side in the morning. It will be the shady side in the afternoon. The opposite side will then

be the sunny side. Wherever you are, find out where the sun rises in the morning and where it sets at night. The direction in which you look for the rising sun is called the east. The direction in which you look for the setting sun is called the west.

Go into the garden or playground at noon and see in which direction your shadow falls. Jump about as much as you please. You will find that your shadow always falls in the same direction. This direction is called the north. You might notice at the same time that at noon the sun is highest in the sky. It is most nearly over our heads at that time. When you know the north you will want a name for the opposite direction. It is called the south.

When you have found out all these directions for the place where you live, you will find that when you stand facing the north you have the east on your right hand and the west on your left. The south is at your back. Try this for yourself.

6. The Hemispheres. The equator divides the globe into two equal parts. These are called half-spheres or hemispheres. The hemisphere in which we live is the northern hemisphere. Its pole is the north pole. The other hemisphere is the southern hemisphere.

Its pole is the south pole. Find all these on the globe.

7. The Continents. The surface of the Earth is made up of water and of dry land. The lands of the world form three great masses. These are the Old World, the New World, and Australia. Look them out on the globe.[1] They are surrounded by the one great ocean of the world. Different names are given to different parts of this vast ocean. Look out the Atlantic Ocean, the Pacific Ocean, the Indian Ocean, and the Arctic Ocean.

Notice that the Old World is almost cut into two separate pieces. A narrow neck of land, called an isthmus, unites them. Find on the globe the part of the Old World called Africa. The rest of the Old World is sometimes called Eurasia. The western part of Eurasia is called Europe. The eastern part is called Asia. Each of these three parts of the Old World is called a continent.

Now look at the New World. It also is nearly cut into two parts which form separate continents. They are joined by a narrow isthmus. Point first to North America on the globe, and then to South America. The

[1] Another great land mass is thought to lie round the South Pole.

sixth continent is Australia. A piece of land entirely surrounded by water is called an island. A piece of land surrounded by water on all sides but one is called a peninsula.

8. A Child's Globe. Now make a globe for yourselves. Get an orange and stick a wooden knitting needle through the middle of it. This will mark the poles for you. Draw the equator where the orange bulges out midway between the poles. Next draw as well as you can the outline of these six continents on your orange. Your teacher will, perhaps, do this for you. Leave the peel on the parts which represent land. Peel the rest of the orange. The white part of your orange-globe will represent the ocean. The higher part with the peel left on will show the lands of the world rising above the seas.

EXERCISES

1. Ask your teacher to show you on the orange-globe where London is. Then try if you can draw a line from London through the white part, or sea, which will bring you back to London without turning back.

2. Which of the six continents are entirely in the northern hemisphere?

3. Which of the continents are entirely in the southern hemisphere?

4. Which of the continents are crossed by the equator?

5. Do you think that there is more land or more water on the globe?

6. Which continents are separated by the Pacific Ocean? Which by the Atlantic Ocean?

7. Stand in the middle of the schoolroom or playground and point towards the North Pole, the Equator, Asia, and North America.

8. Which continents are islands? Which are peninsulas?

9. If you watch a ship sailing out to sea, which part of it do you see last? Can you explain why?

CHAPTER II

DAY AND NIGHT

9. We are not very old before we know the difference between day and night. For half of our life the sun gives no light to our part of the world. Almost all work stops. Men and animals sleep.

What is the reason that sometimes we receive light from the sun, and sometimes we do not?

10. Is the Sun moving? After thinking about this, most of you would say that it must be because the Earth and the sun do not keep the same positions all day. This is quite right. But is it the Earth or the sun that is moving? At first everybody thought it must be the sun. We certainly seem to see it moving through the sky. From a hill-top at night we can see it sink out of sight. Yet this

does not really prove that the sun is moving and that the Earth is at rest. Think what happens in a train. The trees and telegraph poles seem to race by. Are they really moving? We know that they are not. It is the train and ourselves. In the same way the sun seems to move across the sky, because we are watching it from the moving Earth.

11. Watching the Stars move. The stars also seem to move. This you may like to watch for yourselves. Go some winter evening, when it gets dark early, to a window from which you can see the evening star. Put your chair so that the eastern side of the window just hides the star from your sight. If you watch for a little while you will see the star gradually come into sight. It will move across the window and gradually pass out of sight. That part of the world from which we are watching has moved out of sight of the star. To-morrow, at almost the same time, we shall be back again opposite to it. Then we shall see it again.

12. The Cause of Day and Night. Long ago learned men found out why this happens. The Earth is spinning round and round like a top. It finishes one turn in twenty-four hours. These make up a day and a night.

When our side of the world is opposite the sun the other side of the world is turned away from the sun. It is having its night while we are having our day. When we turn away from the sun and have our night it has its day. A new day is always beginning somewhere. This is quite easy to understand, but your teacher can make it still more real to you. Put a lamp on the table to represent the sun, and spin the globe round and round so that each part of it has its share of light. This will show you how dawn, daylight, and night travel round the Earth.

13. You remember how we found the east. It is the direction in which we see the sun each new day. If the sun comes into sight first in the east, the earth must be turning towards the east. It is spinning from west to east. This spinning movement is called rotation.

Exercises

1. In which direction does the moon rise? Why?
2. Is it as warm at night as it is in the day? Why?
3. When it is day in London, what parts of the world are having night? This question you can answer with the globe and the lamp.

CHAPTER III

THE SEASONS

14. Before we are many years old we find that there are great differences between different parts of the year. Children look forward to summer because the days are hot and sunny. Winter is a pleasant season, too, for it is cold enough for skating and snowballing. But the fun on the ice must stop early, for the winter afternoons are short. The sun not only gives less heat in winter, but less daylight too. It is dark as well as cold when we get up on a winter morning. In summer the days are long as well as warm. All these things you have noticed for yourselves ever since you were tiny children. But though you know them so well they still need some explanation.

15. The Earth is moving round the Sun. You will most likely say that the differences between winter and summer are also caused by the Earth moving. But the spinning movement of the Earth would not make any difference to the length of the days. Nor would it give us cold days at one season and hot days at another. But perhaps the Earth or the sun is moving in some other way as well.

It was many thousands of years before men were sure about this. At last they found that the Earth is moving round the sun once in a year of about 365 days. This movement is called the revolution of the Earth.

The way in which the Earth moves round the sun is not easy to understand. The best way to explain it is with the globe and the lamp. This your teacher must show you. Then you will understand that during part of the year the northern hemisphere is tilted towards the sun and the southern hemisphere is tilted away from it. During this time the northern hemisphere receives more light and heat than the southern hemisphere. It has longer days and hotter days. It is having its summer. The southern hemisphere is having less light and less heat. It is having its winter. During the other half of the year the northern hemisphere is tilted away from the sun and the southern hemisphere is tilted towards it. The southern hemisphere then has its summer and we have our winter. The equator has always the same amount of light and nearly the same amount of heat.

16. The Tropics. Perhaps you have noticed that the sun rises much higher in the sky in summer than it does in winter.

Watch this for yourselves. You will see that though the sun is never right over our heads in Britain, it is more nearly so in summer than in winter. Notice its position at noon regularly to be sure of this. It is highest over our heads at noon on June 21. This is the longest day of our year. It is lowest on December 22, our shortest day.

Now look at your globe again. About a quarter of the distance between the equator and the poles you will see two lines marked. These are called the tropics. The northern is the Tropic of Cancer. The southern is the Tropic of Capricorn. It is not very important that you should remember these names. Tropic is a Greek name for turning-place. It shows that men once thought that the sun really turned north and turned south.

On June 21, the longest day of the northern hemisphere, the sun is overhead at noon at all places on the Tropic of Cancer. As the world spins round that day everybody living in places along that line sees the sun right overhead at noon. On December 22 it is overhead at places on the Tropic of Capricorn. Christmas Day is one of the hottest days in the southern hemisphere. The sun is overhead at the equator on March 21 and September 23.

17. The Polar Circles. You must find two other circles on the globe. These are called the polar circles. They are the same distance from the poles that the tropics are from the equator.

When the sun is overhead at the equator on March 21 its rays reach both poles. On June 21 it is overhead at the northern tropic. Its rays reach the North Pole, but they do not reach the places within the south polar circle. On September 23 the sun is again overhead at the equator. Its rays reach both poles. On December 22 it is overhead at the southern tropic. Its rays do not reach places within the north polar circle. Places between the polar circle and the pole have almost continuous daylight in the middle of the summer of their hemisphere. In the middle of their winter they have almost continuous darkness.

18. The Light and Heat Belts. The parts of the world between the equator and the tropics are hotter than the rest of the world. There is no very great difference between the heat of summer and the heat of winter. The days are nearly the same length all the year round. The sun is always high in the heavens at noon. These are called the **tropical regions.**

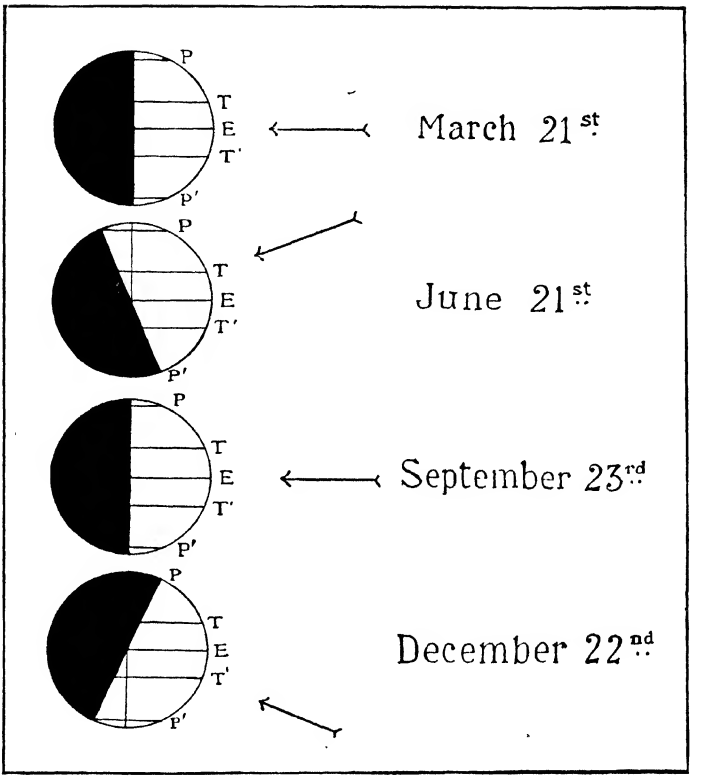

FIG. 1. DAY AND NIGHT AT DIFFERENT SEASONS.

This diagram shows how the sun's rays fall on the Earth at different seasons. The arrows show the sun's rays. P, P' are the north and south polar circles. T, T' are the northern and southern tropics. E is the equator. When the sun is overhead at the equator on March 21 its rays reach both poles. On June 21 it is overhead at the northern tropic and its rays do not reach places within the south polar circle. On September 23 the sun is again overhead at the equator. Its rays reach both poles. On December 22 it is overhead at the southern tropic and its rays do not reach places within the north polar circle.

The regions round the poles have long dark winters. In midwinter the sun's disk is not seen at all. There is a glimmer in the sky towards noon, but no real light. As spring draws on the sun's disk gradually comes into sight. At first it is only a bright line which is seen for a few minutes. Day by day it gets larger and rises higher. During the winter the seas are frozen. The summer days are long and light. In midsummer the sun's disk does not disappear. But it does not rise nearly so high in the sky as it does in our country in summer. The sea and land are too deeply frozen to thaw, except on the surface.

Between the tropical and the polar regions are the temperate regions in which we ourselves live. They are cooler than the tropical regions and warmer than the polar regions.

Exercises

1. On your orange-globe mark the tropics and the polar circle.
2. Describe summer in the temperate regions.
3. Describe winter in the temperate regions.

CHAPTER IV

CLOUDS AND RAIN

19. Think a little now about water. You all know what happens to it in very cold weather. It freezes into ice. Suppose you put a lump of ice into a kettle, and set the kettle on the fire. The ice would turn into water, and the water would turn into 'steam'. You would see 'steam' coming out of the spout of the kettle. Suppose you let the kettle boil dry. There would be no more water in the kettle, and no more steam. What, then, has become of the water of which the ice was made. It has passed into the air of the room. You cannot see it any longer. You cannot see the air either.

20. If we cannot see the air, how do we know it is there? The answer is that we can feel it moving when the wind blows. We can see the work the moving air does. It tears the leaves from the trees, and carries them along with it. If it is strong enough it may even blow down the tree.

Our world consists of land and water which we can see, and air which we cannot see, but

which we can feel. Air is always air. Land is always land. But water has many forms. It may form ice, or water, or vapour.

21. Now think what happens if you spill some water. Sooner or later the place gets dry. Where has the water gone? Into the air. It has changed from visible water into invisible water-vapour. When the air is dry and warm it can take up moisture quickly and the place soon dries. But if the air is cold or damp it takes up moisture very slowly and the place is a long time in getting dry. You all know how difficult it is to get wet clothes dried on a damp or cold day.

22. A certain degree of cold makes water-vapour into water. If you go into the wash-house on a washing day you will see that the window-panes are covered with a kind of cloud. Drops of water may be trickling down the pane. Where did this cloud come from? The air of the room is full of moisture. Where it touches the cold glass it takes a form which you can see. No doubt you have often made such a cloud by breathing on a window-pane. The cold glass chills the moisture in your warm breath till you can see it.

23. Rain. As the winds move over the seas of the world they take up moisture. In

fine warm weather this moisture is invisible. In cold or damp weather it becomes visible as cloud or fog. When the clouds are so full of water that they can hold no more they let some fall as rain.

24. The clouds may be high above the earth or they may be quite low. If you live in a hilly country you have often seen the clouds covering the tops of the hills. If you walk into this cloud your clothes become quite wet. Often you will find rain falling. Mountainous parts of the country have more rain than the plains.

25. In our own country we can never be sure that it will be fine to-morrow. We have rain all the year round. Still you might try to find out if we have more rain in summer or in winter. Make a note of every wet day. Count the wet days. This is a very rough way of telling. Some years are wet and some years are dry. If your school has a rain-gauge, as it ought to have, you could measure exactly how much rain falls every day, and every month. If you compare different years you will find that winter is usually wetter than summer.

Find the British Isles on the globe. You see that to the west is the immense Atlantic Ocean. Most of our rain is brought by south-

west winds which have blown across this ocean.

26. The Influence of the Sea. Take off your shoes and stockings, some hot day, and walk on the pavement on the sunny side of the street. You will find it painfully hot. You will be glad to dip your feet into the nearest running water. This will feel deliciously cool. Why does the pavement or the road feel hot, when the water feels cool? It is because land heats much more quickly than water. You have often bathed in the sea in summer. You know quite well that the sea is cooler than the land in summer. The land cools more quickly than the sea in winter. In winter the sea is warmer than the land. It was never so hot as the land, but it has kept its heat longer.

27. In summer the cooler sea cools the winds that blow over it. In winter the warmer sea warms the winds that blow across it. In our own country we get mild south-west winds from the Atlantic Ocean in winter. Our rivers and seas seldom freeze. In summer we get cool south-west winds, which prevent our summers from being unbearably hot. A region with no sea breezes has hotter summers and colder winters than it would have if it were near a great ocean.

EXERCISES

1. Why can you see your breath on a cold morning?
2. Why do people often say that it will not be fine till the wind changes?
3. Which is wetter, the west of England or the east? Why?
4. Point out on the globe the part of Europe which should have the hottest summers and the coldest winters.

CHAPTER V

RAIN AND RIVERS

28. Hard and Soft Rocks. Next time it is raining go into the middle of the road. Watch what is happening there. The middle of the road is the highest part. It is made higher that the water may run down on both sides. Watch the water running off in this way to the gutters. Each drop takes the easiest way and follows any slight slope. The drops collect into small streams. These also follow the easiest slope. These streams join each other and form tiny rivers. In this way all the water is carried to the gutter.

In some places the surface of the road is probably soft. If so, go to it as the rain is drying up. Where the rivers ran you will find a network of dry channels cut below the level

of the rest of the road. These were made by the little streams. They wore off part of the soil of the road as they flowed over it. This they carried onwards with them. That is why the water in the gutters looked so muddy.

Look carefully at these little channels. They will teach you a great deal. All rivers cut channels in this way, by wearing away the soil and rocks over which they flow. Every river is busy making its valley.

How much soil a river wears away depends on the kind of rock and soil over which it flows. If you look at an asphalt road after rain you will find no network of river channels. The asphalt is too hard to be much worn by a single day's rain. Still less would the stone pavement show any trace of the water that ran over it. Soft rocks are more easily worn away than hard ones.

Now let a day pass and go back to the first road. The little channels will have gone. This is mainly because of the traffic. They would remain longer in an unused road, but even there they would disappear at last. You have seen deep cart-ruts in the lanes in winter. They are worn down before the summer is over. The sun dries the mud and the wind carries it away as dust. Everywhere

and always the surface of the ground is being altered by the work of air and water.

29. Springs. Rocks are of many kinds. Some are hard and some are soft. Chalk is a very soft rock. Granite is very hard. Some rocks let water pass through them. Others do not. Limestone lets water sink through it. Clay does not.

When rain falls it either sinks into the ground or it does not. Suppose it falls on rock through which it can sink easily. It will sink till it reaches some kind of rock which stops it. What happens to it then? It flows along the top of this rock, following its slope. Somewhere this rock may reach the surface. If so, the water comes out as a spring. Such springs are often the sources of rivers.

But suppose the rock through which it cannot pass does not come out at the surface. What happens to the water then? It remains imprisoned. Some day a well may be sunk there and may reach it.

30. Rivers. What becomes of the rain which does not sink through the earth, or of the water which gushes out on a hillside as a spring? It flows off, as we saw the rain flowing off the road. Each trickle follows the easiest slope.

Let us follow the course it takes. Drops gather into tiny streams, which follow the slope of the land. Little streams unite with each other to make a little brook. This joins with others. The size of the infant river is always growing.

These streams do not find their way downhill quite haphazard. All the streams are wearing away soil and cutting channels. They are making valleys, large or small. These valleys are the lowest and easiest ways the water can take, and they become the gathering-places for the waters from the hills on either side.

31. Valleys. Your teacher must take you an excursion to look at a valley. You will find that its sides are more or less sloping. A stream flows along its floor. The floor of a valley is steepest in its upper part. It becomes gentler as it passes from the hills into the plains. A valley is a natural way, made by running water, from the hills to the sea. (See Fig. 2.)

EXERCISES

1. Draw a map of a river made by rain on a road.
2. Describe any valley near your home.

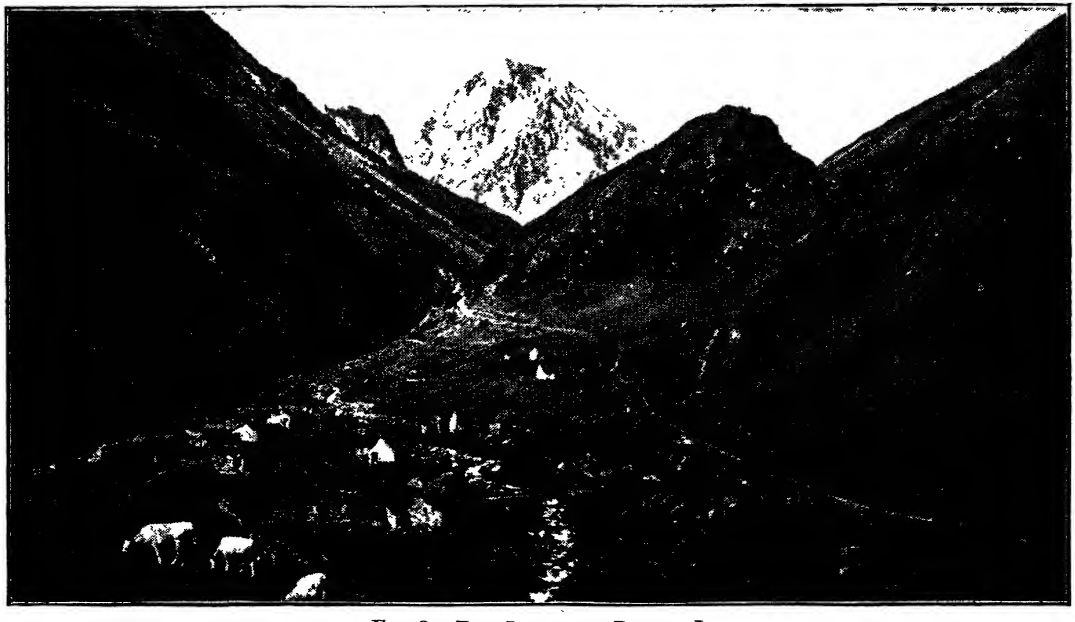

FIG. 2. THE LIFE OF A RIVER. I

This gives a very good idea of the valley of a mountain stream. The valley is very narrow, and its slopes are very steep. The trees are little more than bushes. There is enough grass to feed a few animals. Some small shepherds' huts are also shown. In the distance is a high peak, too high for grass or trees.

CHAPTER VI

RIVERS AND THEIR WORK

32. Mountains and Rivers. The lands of the world slope more or less gently to the sea. The higher parts form mountains and hills. Without this difference of level there would be no rivers.

33. The Course of a River. You must always think of a river as flowing from a higher to a lower level. Its upper course is over the higher land, where the slope is steeper. Its lower course is over lower land which slopes more gently towards the sea. Looking down stream, you have the right bank on your right hand and the left bank on your left hand. The place where it enters the sea is its mouth.

34. You drew the picture of a river made by rain on a road. The picture of any other river would be very like it. A river rises or begins as small streams and rills, which are called its sources or head-waters. These unite to form larger and larger streams, and at last make up a single main stream. The streams which enter the main stream are called tributaries. The place where two streams meet is called their confluence. The land crossed by a river and all its tributary streams is called its basin.

All the rain which falls on any of the land in the basin is carried at last to the main stream.[1]

35. The sources of streams flowing to one river are separated from the sources of streams

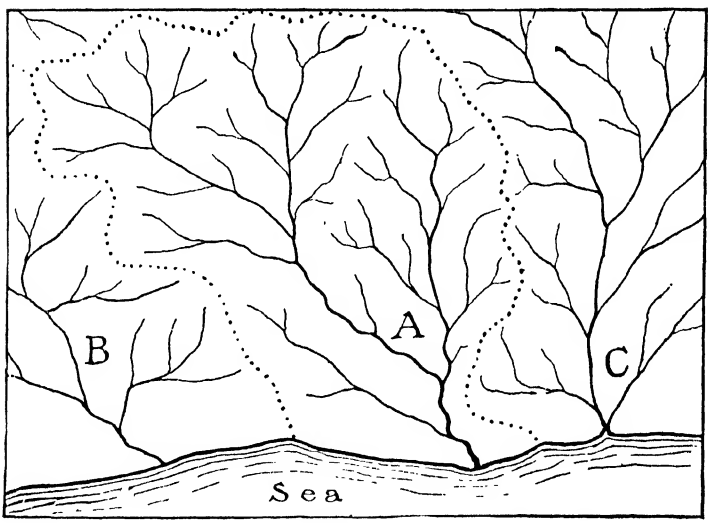

FIG. 3. A RIVER BASIN

The dotted line marks off the basin of a river, A. The rain which falls on the land within the dotted line is carried to the sea by river A. Two other rivers, B and C, are shown. The dotted line divides the basin of river A from that of river B and that of river C. The whole basin of river A is shown, but only a part of the basins of rivers B and C.

flowing to another river by higher ground. This higher ground is the divide between the rivers. It is also called the water-parting or

[1] Remember that some of the rain may have sunk through the ground. (See § 29.) We cannot be sure that this reaches the main stream.

the watershed. A very small difference of slope is enough to give two streams different directions. There are, of course, divides between different streams flowing to the same river.

36. The Destructive Work of Rivers. Most of you must live within an easy walk of a stream. Go there one holiday and pick some stones out of its bed. You will see that most of them are smooth and rounded, and that they have no sharp corners. Among them you may find a piece of broken glass. Its edges have been smoothed and rounded in the same way. You know that when the glass or bottle was broken it was not like this, but had sharp edges which would have cut your hands. It must have been worn smooth while it was in the stream. The running water has continually been rubbing it and the stones against each other till all have become round and smooth and polished.

The larger pebbles are always becoming smaller, and at last they are worn down to fine grains of sand.

This gives you some idea of the amount of work which running water does. It not only wears away the stones in its bed, but also the sides of its banks and the land over which it flows. We call this the destructive work

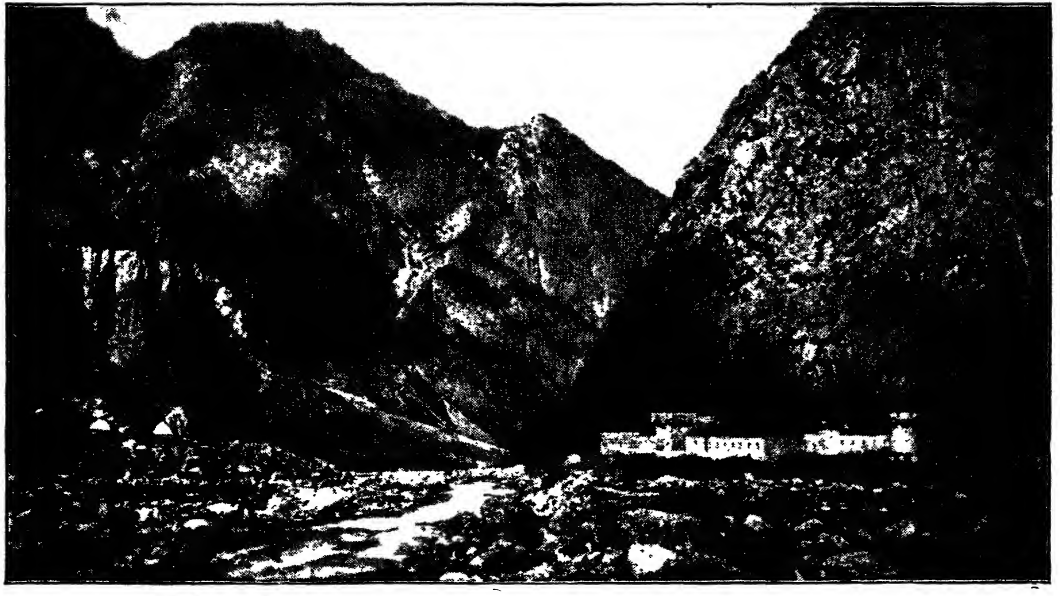

FIG. 4. THE LIFE OF A RIVER. II

Here the river is flowing in a gorge or defile, shut in by steep mountains. The valley is so narrow that there is room only for the river. Notice the great stones which the river is bringing down. It is very difficult to make a road up this part of the valley.

of rivers. We saw it on a small scale in the channels cut by rain on the road. (See § 28.)

37. Some rivers do more than others to wear away the land over which they flow, and carry much more rock waste and sediment with them. This depends partly on the hardness or softness of the rocks and partly on the strength and swiftness of the current. Some rivers rise at no great height above the sea and flow over land with a gentle slope. Such rivers never have very swift currents. Others rise high and cut deep narrow upper valleys in land which has a steep slope. The valley floor slopes steeply, and this gives the river a swift current. In the rush of their descent streams often make waterfalls. Such rivers wear away much more rock and soil than slower streams would do, and carry much more rock waste and soil away.

38. Water which is moving quickly can carry more sediment than water which is not. It is easy to prove this. Take a basin and put some sand in it. Fill it with water. Stir it violently till the water is swirling quickly round and round. The water will become dirty, for it has caught up the sand and is carrying it round with it. Put the basin away and leave it. By and by you will find the water still and clear.

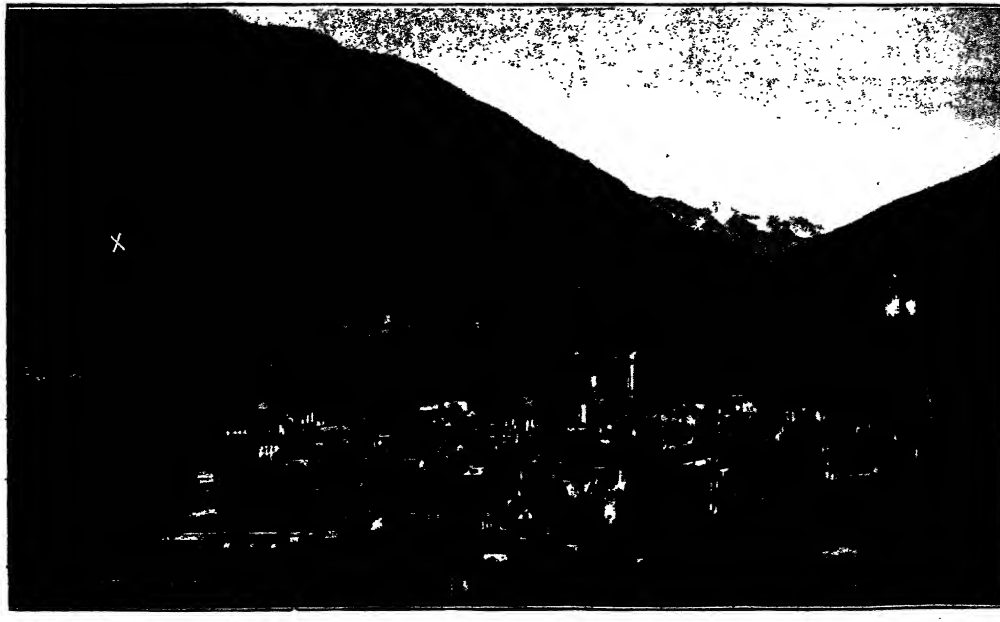

FIG. 5. THE LIFE OF A RIVER. III

Here the valley is wide enough for a good-sized town to be built. You can make out the course of the r, though it is hidden by trees. Below the white cross the hill sides are terraced and cultivated.

It has dropped the sand to the bottom as its motion slackened. You may have noticed the same thing in the streams you know. After heavy rains they flow more quickly and are more muddy than after dry weather.

39. The Lower Course of a River. As a river passes from the hills to the plain the slope of its valley becomes more gentle. In its lower course it often winds over flat land, which it floods from time to time. As the current becomes less swift the river no longer wears away so much of the land nor carries so heavy a load with it.

In its lower course the river drops much of the sediment it is carrying. Thus a constant process of give and take is going on. The land carried from one place is set down again in another. Rivers are constantly destroying land in one part of their courses and constantly making new land in others.

40. These changes are always going on, but so slowly that we do not see them. In times of flood they are more violent and we notice them. When heavy rains fall in the hills the swollen rivers rush wildly down their steep valleys, tearing away the banks on either side and sweeping everything along with them. Every stream that hurries down to them is doing the

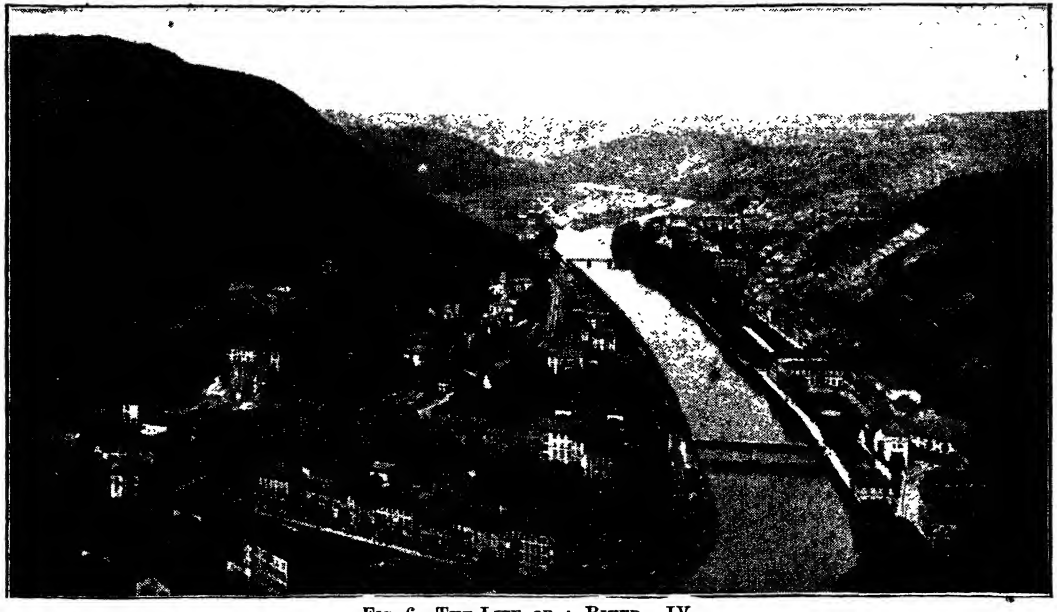

FIG. 6. THE LIFE OF A RIVER. IV

This picture has been chosen to show the flood plain made and levelled by the rivers. It is marked by a cross. The town is built partly on a flood plain, partly on the hill slopes. Notice that these are terraced and planted.

same destructive work. When a swollen river reaches the broader and more level part of its valley it broadens out and floods the land on both sides of its banks. This checks its current and lessens its carrying power. Much sediment falls on the flooded land. If you go to the flooded fields after the floods have gone down, you will find everything coated with mud. This mud is the sediment which the river dropped as it slackened.

41. The Constructive Work of Rivers: Flood Plains. Year after year this goes on. In every flood the river spreads out over its lower valley some of the soil it has brought from the hills. The land on either side becomes more and more level. It forms what is called the flood plain of the river. A narrow flood plain is shown in Fig. 6. The soil of the flood plain grows deeper after every flood, and the flood plain is always slowly widening.

42. The Constructive Work of Rivers: Lake Deltas. A good example of the way in which rivers make new land is seen when a river flows through a lake. A lake is water filling a hollow in the land. Lakes are of all sizes, from small ponds to great inland seas.

When a river enters a lake its current is checked by the absence of slope. Its sediment

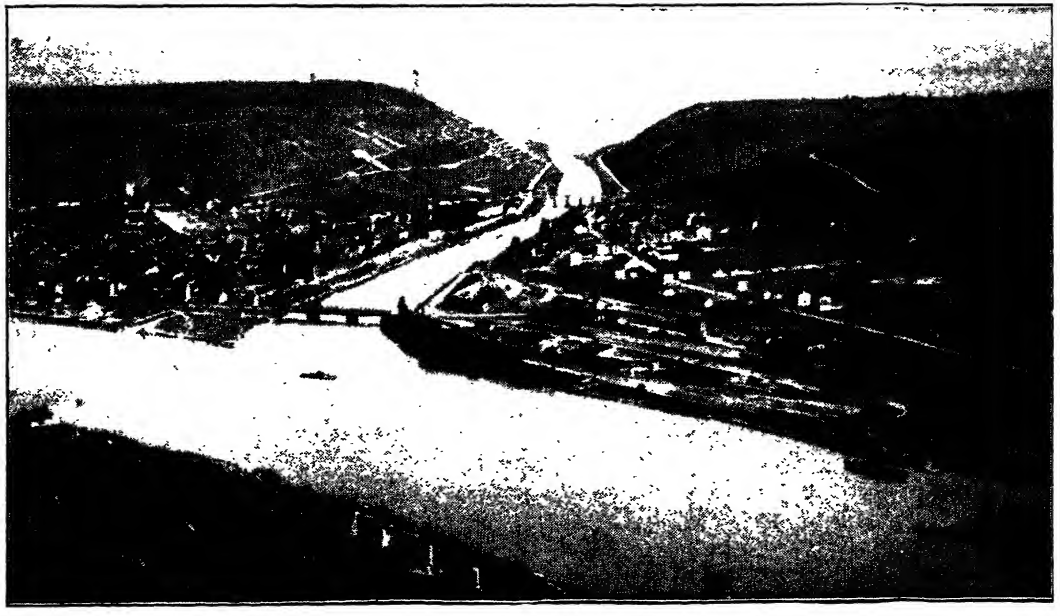

FIG. 7. THE LIFE OF A RIVER. V

This shows a tributary flowing into the main stream. It is flowing between terraced mountain slopes. Notice that land has been formed where the tributary enters. This is due to the checking of the current.

drops on the floor of the lake, and gradually raises it. Parting with its sediment makes a difference to the river. Instead of being muddy, as it is when it enters a lake, it flows out as a clear stream. In time the head of the lake, where the river enters, is filled up by new land made of river sediment. This is called a delta. Year by year the delta grows farther into the lake. Sometimes the river becomes choked by its own sediment and has to cut new channels across the delta which it has made.

43. Some rivers flow into the side of a long narrow lake. These also make deltas which sometimes stretch across the lake and divide it into two.

44. The Land and Water Cycles. In the upper part of its course the river is destroying the land over which it flows. In its lower course it is building up new land. The hills are always getting lower and the plains higher. Two sets of changes are thus constantly going on, the land cycle and the water cycle. The mountains are steadily being carried away to build up new land under the sea. Ages after, this new land may be again raised above the sea and again begin its journey seawards. Similarly, in the water cycle, drops of moisture are drawn up from the oceans into the air, fall as rain, unite to form rivers, and start their journey seawards once more.

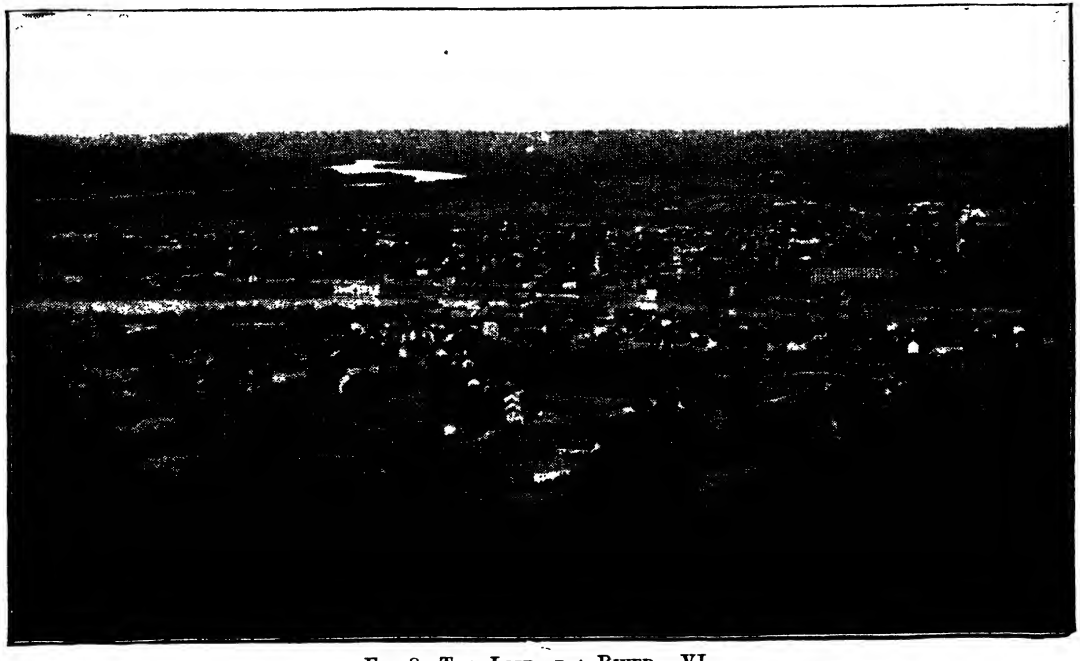

FIG. 8. THE LIFE OF A RIVER. VI

This shows the river in its course across the plains. Notice how it winds in this part of its course.

45. Why we learn all this. The work done by rivers is very useful to man. River valleys form natural routes into the mountains. Instead of climbing the steep sides of the mountains we follow the floors of the valleys. These often lead to a pass. A pass is a depression between higher ground on either side. It is the lowest part of the divide between streams which flow in opposite directions.

The soil which rivers bring down from the hills to the plains is usually very fertile. Some of the richest plains in the world lie at the base of high barren mountains.

The lower courses of rivers have long been useful to man. The broad flood plain can be farmed, and the river used for barges and boats. It is only lately that men have learned to make the swift upper course useful. Now the strong current is used to make electricity, by which machinery can be cheaply worked.

EXERCISES

1. Make a sandhill in the playground. Beat it down very hard with your spades. Then play gently on it with a garden hose. If you do this carefully, and not too roughly, you will be able to watch the making of a river and its tributaries, and the cutting of their valleys.

2. Take two clear glass bottles of the same size and shape. Fill one at any river or stream near you. Cork it and keep it. Fill the other at the same place after heavy rains. Compare the amount of sediment in the two.

CHAPTER VII

RIVERS, SEAS, TIDES, COASTS, ISLANDS

46. Except in very dry parts of the world rivers flow into the sea. The current is checked in the same way as when a river enters a lake. The river drops its load of sediment, which is either carried away by tides and currents or else remains where it was deposited. If it is carried away it either goes to build up new land beneath the sea, or it may be carried by tides and currents to some other part of the coast. If it is not carried away it builds up new land at the mouth of the river.

47. High and Low Tide. Children who have been to the sea know the difference between high and low tide. When the tide is low the sands are laid bare and children can paddle in the sea or build castles on the sand. At high tide the sands are covered and there is hardly any room to play. Twice a day the sea creeps up the beach as a flowing tide, and twice a day it recedes as an ebbing tide.

48. As the tide comes in you leave your sand castle by the seashore. Next day there is nothing to show that your castle had ever been there. The moving water has spread the sand over the beach till all is level again. This

ought to help you to understand why flood plains are so level. (See § 41.)

49. The Ebbing and Flowing Tide. If you throw your spade into the sea when the tide is coming in the sea will bring it back. If you throw it in when the tide is going out your spade will be carried out to sea. The same thing happens with ships. The flowing tide carries them towards the shore. The ebbing tide carries them away from it.

50. Deltas. We have seen that deltas are formed when rivers enter lakes. The same thing happens when a river flows into a sea where the tide is slight. The sediment is not carried away but is built up into a fan-shaped delta which slowly grows larger. The river is choked by its own sediment, and cuts new channels which are called distributaries. The younger or seaward part of a delta is a network of sandbanks, islands, and muddy channels. These channels are shallow and very difficult to enter. In the course of ages the oldest part of the delta, that is, the part farthest from the sea, becomes solid enough to be drained and farmed.

51. Estuaries. Where the tides are strong enough to carry away most of the sediment, a river enters the sea by one mouth. The tide

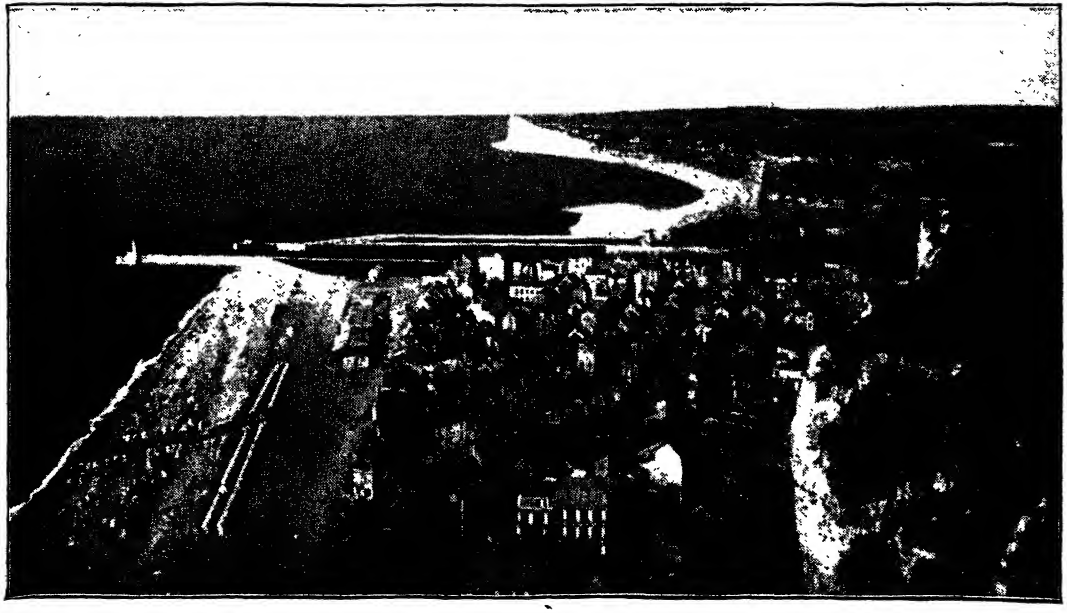

FIG. 9. THE LIFE OF A RIVER. VII

This shows the river entering the sea. Lighthouses and piers have been built to make it safe for ships to enter. Notice the white chalk cliffs of the headland beyond.

55. Much of the beauty of a rocky coast is due to the constant beating of the waves against the cliffs. In the course of ages the sea forces its way into cracks or joints or seams in the cliffs and wears them away, just as rivers wear away the rocks of which mountains are made. Huge caves are hollowed out. The rocks which overhang such caves fall sooner or later to the beach below. Sometimes the softer rocks are eaten quite away. Then masses of rock are cut completely off, forming rock towers like that shown in Fig. 11.[1] The masses of rock which fall from the cliffs lie on the beach and are ground and pounded together at every tide. They are rounded and smoothed in the same way as the pebbles in a river, until they are ground down to sand.

A river has most force when it is swollen by heavy rains. The sea is most violent in storms.

56. Bays, Gulfs, and Capes. Look at the picture in Fig. 9. It shows part of a winding coast, bordered by cliffs, with a narrow beach in front. The town has grown up where a river valley opens to the sea. Beyond the mouth of the river the coast makes a gentle curve inland, forming what is called a bay. A very large bay

[1] This is also partly due to weathering. (See § 62.)

is called a gulf. The bay is shut in by a great headland which projects into the sea. This headland forms a cape. Cape comes from a Latin word meaning a head. In this country

Fig. 11. A Rock Tower, or Stack, cut off from the cliffs by wave action. Compare this stack with that shown in Fig. 14.

low capes are sometimes called ness or naze. This is a form of the word nose.

57. Islands and Seas. Masses of rock cut off from the mainland (see § 55) are often islands at high tide, and can be reached on foot only at low tide. Many islands have been formed in the same way. The sea has cut them off from

the mainland. This happens most frequently where the rocks are soft. The British Isles were once part of Europe. The sea wore away the soft chalk rocks and formed the English Channel. Such islands are never very far from the mainland.

58. Some islands are hundreds of miles from the nearest land. They are peaks of submarine mountain ranges, which rise above the surface of the sea. You must always think of the sea as filling hollows on the surface of the earth. That part of the earth's surface which is above the sea and that part of the earth's surface which is beneath the sea are both crossed by mountains. Near the shore the sea bottom is being slowly raised by river sediment.

QUESTIONS

1. What is meant by the destructive work of rivers? Give some examples of it.

2. How far are floods harmful, and how far are they useful to man?

3. Give as many examples as possible of the constructive work of rivers.

4. Why have some rivers deltas while others have estuaries? Which is more likely to have a good port—a delta or an estuary? Why?

5. Write a description of the scenery shown in Fig. 9.[1]

[1] If more exercises are wanted, almost any illustration may be chosen for description.

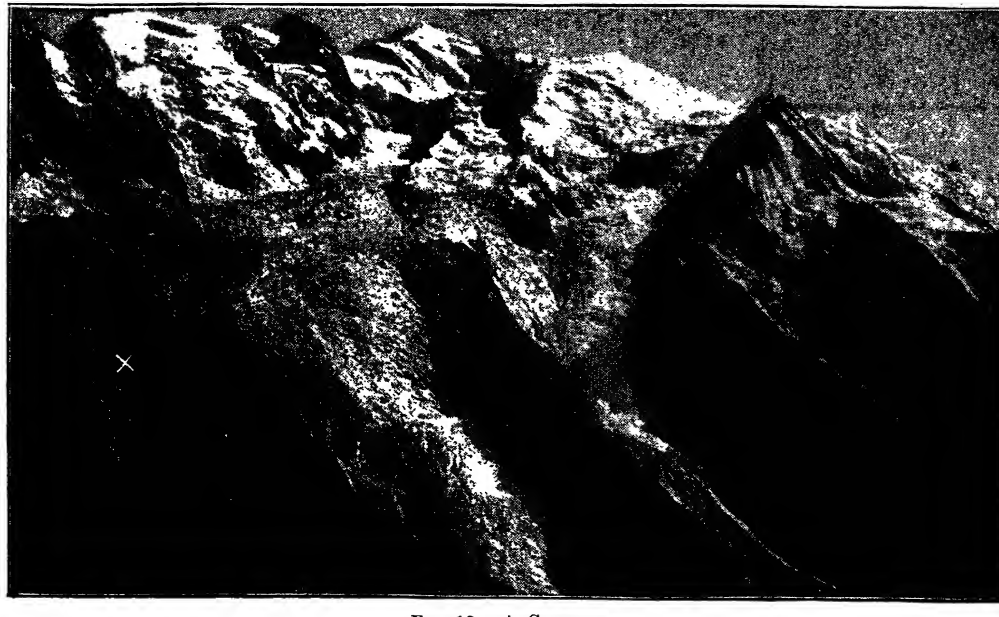

FIG. 12. A GLACIER

This picture shows the way in which glaciers fill the upper valleys of very high mountains. There are two main glaciers separated by a ridge. The white cross marks the course of a small stream. It gives a good idea of the steep narrow valleys which streams cut as they descend the upper slopes of a mountain or hill.

CHAPTER VIII

MOUNTAINS

59. Valley Slopes. If you have looked carefully at any valley you must have seen that the floor is the narrowest part, and that the sides slope more or less steeply away from each other. (See Figs. 2, 4, 5, 6, 7, 8.)

Why should the sides of the valley slope in this way? Perhaps you will say that when the river first began to cut out its valley it was broader and cut a broader valley. It is hardly likely that most rivers have shrunk in this way, so we must find a better explanation.

60. In Fig. 13 there is a picture of a valley in a very dry part of the world. The sides are very steep and quite unlike the sloping sides in Figs. 2, 4, 5, 6, 7, 8. This makes us think that perhaps the slopes of a valley are always slowly changing, and that the rain which falls on them helps to wear them away. This is quite true. After every shower there is a slight movement of soil and water downwards from the top towards the floor of the valley. It is too slight to be noticed in a day or a year, but in the course of ages it gives a valley the sloping sides we see. Often streams flow down the sloping sides to the stream which runs along

FIG. 13. A RIVER VALLEY IN A VERY DRY REGION

Notice the deep steep sides of the valleys. They are quite unlike the slopes in Figs. 2, 4, 5, 6 8. Such deep steep-sided valleys are often called canyons. They are found only in very dry countries.

the floor. From these causes the valleys are always growing wider and the slopes of the sides more gentle.

How fast the valley widens depends on the kind of rock. Valleys in soft rock are wider and have more gently sloping sides than valleys in hard rock.

61. Weathering. You know what happens to the ground in a dry summer. Great cracks appear in the fields. The dry soil crumbles at a touch. Every breeze starts a cloud of dust. All this causes some slight alteration in the surface of the ground. When ages have passed the changes become very great.

Frost also alters the surface of the land. When water freezes into ice it takes up more room than before. This is why water-pipes burst in a frost. In cold weather any water in the cracks of the rocks freezes. This helps to split off loose pieces. If you look at a stone wall you will find that it is much cracked and splintered. The pieces which break off become still more cracked and splintered. In time they are reduced to dust.

This is always going on in the rocks of which mountains are made. Hot and cold weather, wet and dry weather, are slowly wearing them away. These changes are called weathering.

FIG. 14. A WEATHERED HILL-SIDE

Notice the tall stack (compare Fig. 11) and the fragments of weathered rock which show the steep hill slope. The stack is called the "Devil's Chimney." Notice how it is cracked and split by weathering.

Fig. 14 shows how rocks weather. A rock needle stands out from the face of a steep slope. The needle itself is much splintered and the slopes above and below are strewn with fragments of weathered rock.

62. This slow shaping of the surface of the land has been going on for many ages. The higher parts of the land have been carved into mountain ranges and peaks, with valleys between. Heat and cold, wind and water, have been steadily at work on the slopes. This has given most of the mountains of the world their present shapes.

In the early life of a mountain region the peaks have wild and beautiful shapes, with steep precipices and towering pinnacles of rock. The valleys may be so steep and narrow that a road has to be blasted. (See Fig. 4.) As the ages roll on even the hardest rocks wear away. The peaks become lower and less sharp. The slopes become less steep. The valleys become broader. The valley floors become more level.

63. Glaciers. The mountains are colder than the plains. You have seen the snow lying on the hills long after it has melted in the streets. Yet most of you have never seen any really high mountains. There are not

any in our own country. Sooner or later, all the snow on our highest mountains melts. It never remains all the year round.

In other parts of the world there are much higher mountains. No mountain in our country is one mile high. The highest mountain in the world is six miles high. On very high mountains the snow never melts. It may be hundreds of feet deep. The summer sun melts only the surface. At night it freezes again. These snow peaks are a beautiful sight.

The snow becomes very deep in the valleys between the peaks. Snow slides down all the slopes into the valleys. Here it is piled and pressed together. You all know that if you want to make a snowball hard you squeeze it very tight. The harder you squeeze it the more like ice it becomes. In the high valleys the pressure is so great that the snow is actually pressed into solid ice. It forms a river of ice, called a glacier. (See Figs. 12, 15.)

Do not think that a glacier is a frozen river. We call it a river of ice because it is moving very slowly down the sloping valley. It is pressed forward by the ice behind. We cannot watch it moving as we can a river. Still it

does move, though very slowly. It grinds away the rocks over which it passes. It wears away the rocks on both sides. All this rock waste it carries along with it, partly underneath and partly on the top. This rock waste forms what are called moraines along the side of the glacier. Like a river, it is always deepening its valley.

At last the glacier reaches a part of the valley which is less high and cold. Its lower end begins to melt. This forms a river. (See Fig. 15.)

64. Winter and Summer in the Mountains. The highest peaks are covered with snow all the year round. In summer the lower valleys and mountain slopes are green. In winter they too may be covered with snow. The streams and waterfalls freeze. Parts of our own country are high enough to be covered with snow in winter.

When spring brings warmer days the lower snows begin to melt. The frozen streams thaw. The melting snow carries soil and water down to them. They rush down in flood to the plains. All through summer they may be kept full as the snows melt higher and higher up the valley. But the snow peaks and glaciers hardly feel the difference between

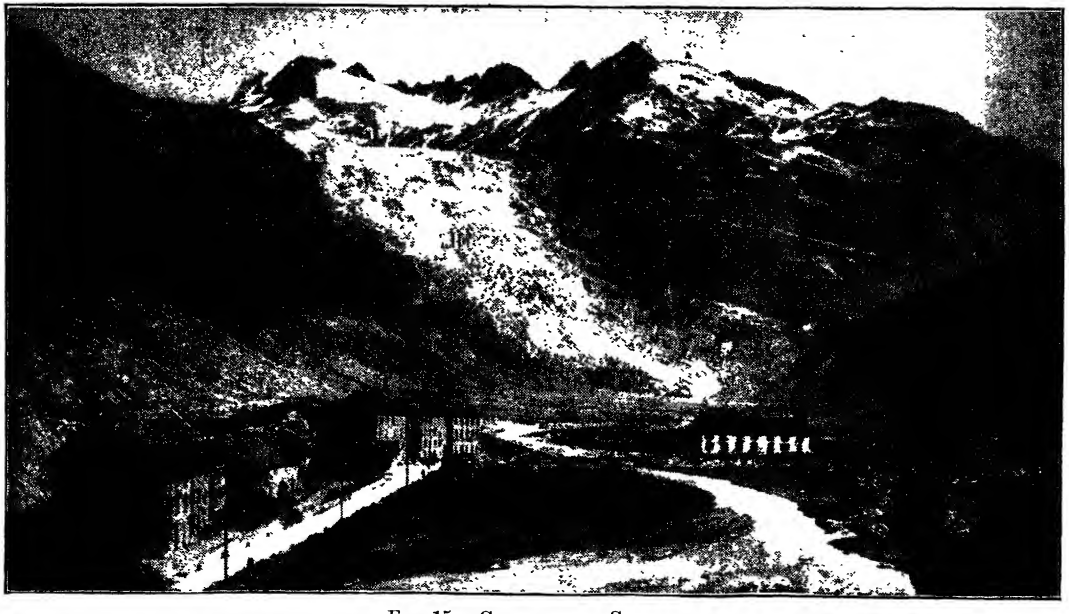

FIG. 15. GLACIER AND STREAM

Here you see a stream flowing from the end of a glacier. In looking at this picture and at Fig. 12 remember that all streams do not rise in glaciers. Notice that the valley is very narrow, and that the slopes are very steep. We are very near the tree line. A few small pines are the only trees.

winter and summer. If the surface thaws a little in the day it freezes again at night.

65. What is a Plateau? Sometimes a whole region rises more or less steeply above the plains. River valleys lead up towards what look like distant mountains. But as we go higher and higher up the valley we find that it does not bring us to the top of a pass across a mountain range. At the head of the valley more plains open before us. We have climbed up to a country which is more or less level, though it is high above the plains below. Such a region of high plains is called a plateau. If there are mountains on the plateau they are all nearly of the same height and not much higher than the rest of the plateau.

If we look at it from below, the high edge of the plateau looks like a range of mountains. The river shown in Fig. 7 is passing through a plateau country.

66. Mountains and Rain. You know that mountains are wetter than plains. The clouds often cover them when it is fine in the plains. One side of a mountain is generally wetter than the other. The wet side is the side facing the rainy winds.

67. Every time that rain falls on the mountains a certain amount of soil is carried down

all the slopes to the valleys. The rivers also wear away a great deal from the valley sides. So there is very little soil on the mountain slopes. Every shower carries away some of this little. In high valleys the people do all they can to keep the soil from being washed away from the hill slopes. They cut terraces to make the slope less. They make these terraces flat, and the soil in them as deep as they can. The hill-side is cut into something like a flight of stairs. As the slope is then much less steep, the soil is not so easily washed away. All over the world men have terraced and cultivated the lower slopes of the hills. (See Figs. 5, 6, 7.)

68. Mountains as Barriers. In mountain regions the villages are in the valleys. To go from one valley to another a pass must be crossed. This often means a long and difficult journey. The valleys are often very narrow. The road may run along the face of steep and dangerous precipices. (See Fig. 4.) The wild stream may have to be crossed many times. There may even be a glacier to climb before the pass is reached.

Passes are very important in a mountain country. If the passes are low and easy it matters little if the peaks are high. It is

more important to learn the chief passes of a mountain region than to know the names of the highest peaks. It is by the passes that such a region is crossed.

Mountain lands have not many inhabitants. The life is a hard one. Very little can be grown on the steep slopes of the hills. The winters are long and hard. The villages remain small and far apart. Many of the young men and women go far away to seek their fortunes.

69. Volcanoes. Some mountains are seen to smoke. If you climb to the top you find yourself looking down a kind of funnel into the smoke and glow. This is the crater of the volcano. Out of this crater the volcano sometimes throws ashes and lava. The ashes rise high into the air. The lava flows down the slopes. It looks like a river of red fire, moving very slowly. It cools into a very hard kind of rock.

The ashes which the volcano throws into the air fall back upon its slopes. They gradually build up a sloping cone round the crater. It is very difficult to climb such a cone. The sides are very steep. It is almost impossible to climb in the loose ash. But the wonderful sight when you look over the edge of the crater is worth the toil.

70. There are many volcanoes in different parts of the world. Once there were many more. Many old volcanoes still have perfect

FIG. 16. A VOLCANO

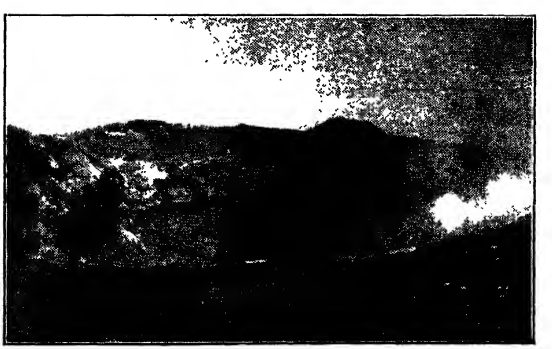

FIG. 17. THE CRATER OF A VOLCANO

craters at the top. The surrounding country is covered with the lava that once poured from

them. Lava is so hard that it weathers very slowly. The soil in a volcanic district is very thin except in the valleys. Where it is deep enough to be cultivated it is very fertile. The people make quarries in the lava and use blocks of lava for building and paving their towns.

EXERCISES

1. Which is the wettest side of the mountains of Britain? Why?

2. Make your sandhill with sloping sides. Wet it a little to bind it. Then try to terrace it. You will then see why terracing is useful in a mountain country.

3. What causes a valley to become deeper?

4. What causes a valley to become broader?

5. Will the mountains of the world always keep their present shape? Why?

CHAPTER IX

PLANTS AND ANIMALS

71. You all know what plants are. You have noticed many differences between them. Some grow close to the ground. Others spring up into bushes and trees. Most trees in this country lose their leaves in winter. A few keep their leaves all the year through. These are called evergreens.

72. All plants need light and moisture. If you have a garden you know that their tastes differ. Some like much sun. Others like little. Some need much water. Others must be kept dry. So you would not expect to find the same kind of plants all over the world. Plants which like heat and sun grow in hot countries. Plants which can bear cold well grow in cold countries. The plants of dry countries differ from those of rainy ones.

73. The Influence of Mountains. Some of you must live near a high hill. Perhaps there are woods and fields at the bottom. Higher up the trees become fewer. If your hill is very high indeed you will come to grassy slopes with no trees at all. Still nearer the top you will find moss instead of grass. At the very top you may have to climb over bare stones. Climb the highest hill near you, and see what differences of this kind you can find. The higher a mountain is the greater is the difference between the plants at the bottom and the plants at the top.

You know the cause of this. Mountains become colder as we go higher up their slopes. The upper slopes are too cold for the plants which grow on the lower slopes. Our own country has no very high mountains, yet the

higher slopes are often too cold for trees. Grass can live at a greater height and in poorer soil. Lichens and mosses can bear still greater cold and do with still poorer soil.

Now whole regions of the world are higher above the sea than the tops of any mountains in this country. Some of these are quite near the equator, in the hot belt. Their lower slopes have a very hot climate. The higher slopes become cooler and cooler till they reach a height at which nothing will grow on the bare rock. Higher still they are covered with snow.

We cannot tell what plants a country will produce if we know only the distance from the equator. All depends on whether it is high above the sea or not. We must also find out whether the climate is wet or dry.

74. Wet and Dry Climates. Whether a climate is wet or dry depends on the winds. Where these blow off large seas a country has plenty of rain. Our country has a moist climate because of the winds which blow from the Atlantic (see § 27). The farther a land is from the sea the drier it is. All the large continents are dry in the centre except near the equator. This means that moisture-loving plants cannot live there.

You remember that a country near the sea

has cooler summers and warmer winters than it would have if it were far inland. The interior of large continents have hotter summers and cooler winters than the coasts. The hot summers make it impossible for some plants to live. The cold winters make it impossible for others.

75. The Uses of Plants. You remember that a pavement or road feels very hot to our naked feet in summer. If we step on to the grass it is not nearly so hot. Feel the soil below the grass. It is not very hot. Why is this? It is because plants protect the soil with their leaves. They protect it from cold as well as from heat. The bare soil becomes more deeply frozen than the lawn. Wherever there is no plant covering, the land heats and cools much more quickly.

Plants protect the soil in other ways. Why do we put moss round a flower-pot? To keep the roots moist. The moss prevents the moisture of the soil from passing too quickly into the air. What moss does for a flower-pot, plants are doing all over the world.

76. The roots of plants hold the soil together. If trees grow by a river-side the bank is not worn away so quickly. If there are forests on the slopes of a mountain the

soil will not be washed down so easily to the valleys. The branching roots hold it together. In many parts of the world men have cut down the forests on the mountain sides. The soil has been washed away, leaving the mountains bare and barren.

77. Without plants the Earth would be a dead world. Neither man nor any other animal could live. All animals live on plants or on the flesh of animals which eat plants.

The world, as we know it, is full of life. The seas and rivers are the home of fish. The air has its birds. Four-footed beasts of many kinds live on the land. Men have trained many of these to serve them. Animals used in this way are plant-eaters, except the dog. There are countless reptiles and insects. Some of the insects are useful to us. You will think of the bee and the silkworm.

78. Plants are not useful for food only. Some supply timber for building houses, boats, carts, furniture, and other things. Many plants have strong fibres which can be twisted into ropes or plaited into baskets or woven into cloth. Other plants are useful medicines. You can easily go on with this list.

79. A Useful Tree. Some plants can be put to many different uses. One of the most

valuable is a palm which grows in the tropics. It is a tall tree which would tower high above any ordinary house. Its leaves are longer than a tall man. The stems of these leaves are like thin boards. If they are wetted they become soft. Then they can be made into different shapes. They are rounded into basins, pails, and cooking-pots. They are shaped into baskets. They are cut into plates and dishes. The leaves are used to thatch houses. The fibres are made into cloth, or into hats or baskets. The seeds are used for fattening animals. The hard shells are polished and put to various uses. The trunk is sawn into planks, which are used in building and for making furniture. The buds are cooked and eaten. The roots are used as medicine.

Many other plants can be used in almost as many ways. One is the bamboo, which you have seen made into furniture. The coco-nut and the banana are others.

EXERCISES

1. Why are there patches of moss on a badly-kept lawn?
2. Which of the continents are driest in the centre?
3. Name some plants which are useful to man for food.
4. Give a list of different ways in which plants are useful to us in daily life.
5. Name some plant-eating animals which are useful to man.

CHAPTER X

THE PLANT BELTS

80. The Cold Deserts. We will begin with the lands round the North Pole. The seas are frozen. The lands are buried in ice and snow. For many months in winter the sun is never seen. The return of summer makes little difference. Only the shallow waters thaw. The open seas remain ice-bound. The land is almost as deeply buried in ice as in winter.

Even this desolate region has its life, but it is the life of the sea. In the depths of the ocean sea-plants nourish a whole world of animal life. Fish are abundant. They form the food of seals, walruses, and polar bears. All these animals wear a coat of thick fur to keep out the cold.

81. The Tundra. Farther from the pole the short summer calls many plants to life. As the sun rises higher the snow and rivers begin to melt. The frozen soil thaws for a few inches. All the buried seeds feel the power of the sun. Lichens and mosses make a green carpet over the land.

This region is called the tundra. It is not unlike some of our highest and poorest moors.

Only the hardiest plants will grow. There are no trees. A few low bushes are found in the most sheltered parts. Trees cannot live through such long cold winters. They cannot strike deep roots in the frozen soil.

The tundra is the home of the reindeer. This beautiful beast feeds on the yellow reindeer moss. In winter it digs through the snow with its hoofs to find the buried moss. In summer other animals pay a short visit. They all wear thick fur coats, for which hunters kill them.

The tundra is found round the northern shores of North America, Europe, and Asia. Later on we shall see what kind of life the people live. (See § 97.)

82. The Cold Forests. As we go south across the tundra the country slowly improves. There is some grass. The low bushes become larger. Tiny birches are seen. They grow larger and larger. Then come the first fir-trees. The farther we go the larger the trees are. There are more and more of them. We are passing into a land quite different from the tundra. The winters are not nearly so long and cold. The summers are warmer. The soil does not freeze so deeply. Trees can strike their roots deep down. There is

abundant rain. The trees grow into splendid forests. In the north the forests are of birch, or of evergreen firs. As we go south we come into woods of oak, beech, and other trees which shed their leaves.

A belt of forest stretches across most of North America, Europe, and Asia. The forests have been cut down in Central and Southern Europe, except on some of the mountains. Great oak forests once covered this country. Now only small patches remain. But the forests of North America, Eastern Europe, and Asia have hardly been touched.

83. Cool and Warm Temperate Lands. We are now in the temperate lands. There are great differences in different parts. We live in the colder part. Nearer the equator the summers and winters are warmer than ours. Many plants and fruits which like sun and heat can be grown. In our own country the apple is the commonest fruit tree. Wheat, oats, barley, potatoes, and turnips are common crops. In the warmer lands wheat and maize are grown. The vine, the olive, the orange, the lemon, the fig, the date, are a few of the fruits. Rice is grown in the flooded fields. Cotton is grown where the summers are very hot.

The hotter parts of the temperate lands are very like the cooler parts of the tropical lands.

84. The Steppes. As we go south across the forest belt we come into lands which are distant from the sea. They have hot summers, cold winters, and very little rain. The trees no longer have so good a chance. They become smaller and fewer. At last they disappear. Grasses of various kinds take their place.

These grass-lands are called steppes. They are found in the centre of North America, in Eastern Europe, and in Central Asia. In winter they are buried in snow. When the snow melts in spring the land is soon green with young grass. Great sheets of tulips and lilies brighten the scene. The hot summer sun withers both grass and flowers.

85. The steppes of the Old World were the home of our most useful animals. Herds of wild horses, wild asses, oxen, and sheep still roam from pasture to pasture. In the drier parts the camel is found. This animal can go for days without water. Camels are now used instead of horses in many of the drier parts of the world.

86. The Hot Deserts. The desert is

barren because it is so dry. You may ride on your camel for days without seeing a blade of grass. Bare sand and rocks stretch as far as eye can reach. The few plants are low, dry, and thorny. The sand lizards match the sands in colour.

87. It is a welcome sight to see a tall date-palm in the distance. It means that water is there. The camel smells the water and hurries forward. Such a fertile spot round a spring is called an oasis. Sometimes the spring is small, and the oasis is a mere clump of palms. Sometimes the springs are abundant and the oasis is a large village. It is green and fertile as far as the life-giving water reaches. Beyond are the desert sands. (See Fig. 18.)

Great deserts are found in North Africa, Central Asia, and Australia. Smaller ones lie in the west of North and South America, and South Africa where the tropic crosses the continent.

88. The Savanas. On the south the deserts gradually become less dry. We are passing into a land which has occasional rains. A little scanty grass is seen. Trees make their appearance again. They are of kinds which we do not know, for these lands are within the tropics. The country is well wooded in the rainier parts. In the drier parts it is a grass-

FIG. 18. AN OASIS OF DATE PALMS

This is an oasis of palm trees, fed by many canals. You will see them clearly in the picture. (See § 87.) Notice the high mud walls round the gardens of different owners.

land. The tropical grass-lands are called savanas. They do not have the cold winters of the steppes. The rain falls in summer. The rest of the year is a dry season. The trees and plants are specially fitted to live through the long rainless season.

Many useful plants are grown in the savanas. Cotton is one of them. The tall, graceful bamboo is put to many uses. The banana is one of the commonest fruits.

89. The savanas, like the steppes, are the home of many animals. The tall giraffe is a beautiful savana dweller. The rhinoceros looks strange to our eyes. The hippopotamus haunts the rivers. The lion and other beasts of prey hunt the graceful antelopes, deer, and other fleet-footed creatures. In the hotter, wetter, more forested parts the elephant has his home.

The savanas are found in the tropical parts of North and South America, Central Africa, and Southern Asia.

90. The Hot, Wet Forests. As we cross the savanas towards the equator the trees become larger and more numerous. We are nearing the hot, wet lands round the equator. There is very little difference between winter and summer. Rain falls all the year round.

The forests of South America and of Equatorial Africa are the largest in the world. The trees are of enormous height and thickness. They are of many kinds strange to us. Many palms are among them. Richly flowered creepers twine round the great trunks and climb to the topmost boughs. Ferns and flowers take root in the forks of the branches. The undergrowth is a forest in itself. It is taller than a man, and so thick that paths must be cut with the hatchet. We know little of these forests because it is so hard to make roads into them. The natives use canoes on the streams which flow through them.

The forest is so thick that no large animal can make its way through. The great apes live not on the ground but in the trees. They leap from branch to branch and seldom touch the ground. Parrots and gay birds glitter in the trees. There is a ceaseless hum of insects. Great reptiles haunt the rivers.

. These hot, wet forests must be rich in useful trees that we do not yet know. From these forests we get rubber, which is needed in many manufactures.

91. The Plants of Tropical Lands. None of the plants that we know can be grown in the plains of the tropical lands. The heat is far

too great. In these plains sugar-cane and cacao are grown. The pineapple and banana are among the many fruits. Coffee and tobacco are planted on the slopes of the mountains and plateaus where the heat is less intense. Still higher up it is cool enough for crops like our own. Even in the hottest parts of the world trees cannot live more than two and a half miles above the sea. Above this height there are grassy, treeless slopes. Still higher come mosses and lichens. Higher still are glaciers and snow.

92. The Plant Belts of the Southern Hemisphere. South of the hot, wet forests come the savana lands of South America, Africa, and Australia. Then come the hot deserts of these continents. These pass on the south into the steppes of the three southern continents. In the extreme south the cold forests reappear. There is no tundra on the mainland of any of the southern continents, but it is found on some of the southern islands. The lands round the South Pole are even more frozen than those round the North Pole.

EXERCISES

1. How do steppes differ from savanas?
2. Describe a journey up a high mountain at the equator.

3. Describe very shortly a journey from the equator to the North Pole.

4. Can you point out any way in which these two journeys remind you of each other?

5. Take a white indiarubber ball. Mark on it the poles, the polar circles, the tropics, and the equator. Draw the continents roughly. Draw circles for the cold deserts, the tundra, the cold forests, the steppes, the hot deserts, the savanas, and the hot, wet forests. Paint the hot and cold deserts brown to show that hardly anything grows. Colour the hot and cold forests two shades of dark green. Colour the steppes and savanas two shades of light green, to show that they are grasslands.

6. Are the belts really as regular as you show them in Exercise 5?

7. How does distance from the sea interfere with the regularity of the plant belts?

8. How does height above the sea affect the regularity of the plant belts?

CHAPTER XI

HOW MEN LIVE [1]

93. At the beginning of the Bible story Adam and Eve gathered the fruits of the garden for their food. They were dressed in leaves. This is how the life of man on the Earth began. A few tribes still live in this

[1] Teachers who wish to amplify this chapter should refer to the writer's small book, *Man and His Work* (Black).

simple way. They use only what they find wild. They gather fruits and nuts. They dig up roots. They take birds' eggs. They collect the shellfish uncovered at low tide, or driven on the beach at high tide. They dress in leaves, or grass. They wander from place to place in search of food. They sleep in caves or where they can.

Such a life is very hard. Good times are followed by bad times. When no food can be found the people starve. Their numbers are always kept down by famine and sickness.

A little later in the story Adam and Eve are dressed in the skins of beasts. Early in history men learned to make weapons and kill animals. These supplied them with better food and better clothing.

94. The Hunter's Life. In some parts of the world men still live by hunting animals. This life is also very hard. The hunter is always on the move in search of game. Animals are very wary. They learn what places to avoid. Often the hunter comes back empty-handed after a hard day's toil. Starvation always stares him in the face. If he kills too few animals he starves. If he kills too many he exterminates the game, and then also he starves.

The hunter can never stay long in one place.

Next year, or even next week, he may have to be somewhere else. Hunting tribes do not build houses. They live in caves, or build rude huts of boughs. They have few useful arts. Hunting does not leave much time for other kinds of work. Besides, they want to carry as little as they can in their wandering life. They have little to call their own except their weapons.

95. The Keeping of Animals. There is something better to be done with animals than hunting them. They can be tamed and taught to look on man as a friend. Their young ones will then increase the herds of their masters, and make him rich. Their milk will add to his food. Their strength can be put to many uses. Their intelligence can also be used. The shepherd's dog is almost as wise as his master. The horse and the elephant are hardly less so.

Hunters and animals are foes to each other. The shepherd's dog is the shepherd's friend. When men took to keeping animals instead of hunting them they began to be kinder and gentler as well as richer. It was a great step upwards for our race.

96. Life in the Steppes. The early Bible stories tell us about life in the steppes of the Old World. Here men have kept animals as far as history goes back. They kept camels,

and horses, and oxen, and sheep, and goats. We find Abraham, and Isaac, and Jacob moving from place to place with their flocks and dwelling in tents.

Why do the shepherd peoples move from place to place? It is because the grass in one place is quickly eaten bare by the herds. This is always happening. When the grass is all used, the flocks and herds must move somewhere else. Their masters must follow them. The tents are folded and laid on the backs of camels or horses. The rich, soft rugs of wool and hair are folded and piled on the load. The skin bottles are filled with milk. The party is ready to move.

This is the life which is lived to-day in many parts of Central Asia. Round the feeding-grounds are dark tents made of felt. Inside they are made comfortable with rugs and carpets. These are made of wool and hair sheared from the animals. The chief food is milk. The animals are seldom killed for food.

Shepherd peoples are like hunters in this one thing. They are always on the move. But see the difference which comes from having strong domestic animals. The hunters can carry hardly anything with them. The shepherd peoples can carry much. Only every-

FIG. 19. TENTS ON THE STEPPE

FIG. 20. STEPPE DWELLERS ON THE MOVE
This picture is taken in the drier steppes where camels are used instead of horses.

thing must be easy to fold and pack. This is one reason why the bottles are made of skin.

97. Life in the Tundra. In the tundra of the Old World men live partly by hunting and partly by keeping animals. They have large herds of reindeer. (See § 81.) The animals have to move from place to place in search of reindeer moss. Their masters follow them. They travel in carts or sledges drawn by reindeer. Most of the year the people of the tundra live in tents of reindeer skin. Their winter clothes are also made of skins. Milk and reindeer meat are used for food. The bones and horns are made into many useful things. The strong reindeer sinews are used for sewing-thread. (See Fig. 21.)

In the tundra of the New World the people have no domestic animals. They live by hunting and fishing. On the edge of the frozen seas of North America live the Eskimo, who hunt the seal and walrus.

98. Life in the Desert. The edge of the desert is a kind of poor steppe. A little grass or herbage may be found in spring. A few goats, or even camels, can find grazing for a short time. Their masters camp beside them in their tents, till the scanty pasture is eaten bare.

FIG. 21. LIFE IN THE TUNDRA

This shows the kind of tent used by the wandering Lapps. You will notice their thick fur dresses, their reindeer, and their sledges.

In the true desert the only inhabited spots are the oases. Traders and travellers cross the desert on camels. They carry food and water with them. At night they camp in tents. Their way goes from well to well, and from oasis to oasis. Many camels die on the way, and leave their bones to whiten on the desert sands. (See Fig. 22.)

99. The Cultivation of Plants. From the earliest times men have eaten fruits and seeds. If seeds are planted they produce many more. This has been found out all over the world; the discovery has always made the greatest difference to the people who made use of it. They could count on getting food, and starvation no longer stared them in the face from day to day. Men began to spend more and more time on tilling the ground and gathering its harvests. Hunting ceased to be the most important occupation of life.

In this way a very different kind of life became possible. Plants do not move about like animals. Seeds come up where they are planted. Tillers of the ground need not move from place to place, and their houses need not be moved. They are made strong and lasting. All kinds of things are stored in them for use and for beauty. The harvests

FIG. 22. A HALT IN THE DESERT

Here you see an Arab tent. Notice how few plants there are, and how bare the ground is. Behind the tent you see a dry thorny tamarisk tree.

are gathered into barns. The wealth of the world increases rapidly.

The tillers of the soil were the first settlers. They built the first real houses. In the course of long ages, villages have grown into towns. Great cities have sprung up. Men have learned countless trades and arts. The wealth of the world is enormous. All this has come about because seedtime and harvest do not fail. If the harvests failed all over the world for only a single year all our gold and silver would buy us nothing. The gold of the ripening cornfields is the only real wealth in the world.

100. Life in the Agricultural Lands. Now you understand why the forests have been cut down in many parts of the temperate land. Men have wanted more and more land for sowing and reaping. Every year brings new mouths to fill. Every year more land must be ploughed and sown.

A few of the more important food plants must be mentioned. Wheat is the best grain for making bread. It is grown wherever the summers are neither too cold, nor too wet, nor too hot and dry. Maize takes its place in the hotter parts of the temperate lands. This plant was the chief food grain in the New World. It was introduced into the Old

World by the discoverers of America. Millet and other grains are grown in the hot tropical lands, In very wet, hot countries rice is grown in flooded fields and swamps. In hot dry countries the date-palm grows. It is planted in the oases of many deserts.

Wheat is planted in the steppe lands of Europe, Asia, North America, and in some of the cooler savanas. Its cultivation is increasing all over the world. Every month in the year sees a harvest of wheat ripening in one part of the world or another.

101. The Growth of Arts and Industries. As agriculture became more general, many new trades were required. You cannot plough a field without a plough, or dig it without a spade. Some one must get the iron. This makes iron-mining necessary. Some one must smelt the iron and make the plough. The blacksmith's trade is one of the oldest in the world. The horse, or ox, or buffalo must be harnessed to the plough. This means that the saddler's trade is needed. The harvests must be reaped, and threshed, and ground, and cooked. Many trades are necessary if these things are to be done well.

As men become civilized and rich they no longer go about in fig-leaves, or in skins.

The hair and wool of animals is made into cloth. Cotton, and flax, and silk are spun and woven. Clothes are dyed, and embroidered and ornamented in many ways. All this leads to more trades.

The houses are built to last for many years. All manner of useful and beautiful things are put in them. The cabinet-maker makes furniture. Before he can do this men must cut the timber, and saw it, and polish it. The glass-maker makes glass for the windows. The iron-founder makes grates. Baths are made and fitted. Gas and electric light are added. You could write down many other trades which are needed to fit up a large modern house.

Many of the things needed in these different trades have to be brought from other lands, by ships and trains. Think how many kinds of work have to be done in consequence. The rails have to be laid, the trains built, the ships built and fitted up. There must be men to drive the trains and sail the ships.

102. The Fisher's Life. Long ago men who lived near the sea learned to build and sail boats and ships. At first these were rowed with oars. Then sails were added. Now they are often driven by steam.

As soon as boats were made, men were able to get part of their food from the sea. In some parts of the world fishing is the chief occupation. It is always important round the coasts. In the villages round our shores the children learn to swim and manage a boat when they are quite little. As they grow up the boys go to sea. Perhaps they become fishermen. They may fish near home or go to distant fisheries. The cod fishery takes men far out to sea. The whale fishery takes them to the frozen seas round the poles.

Others become traders. Our merchant ships carry coal and manufactured goods to other lands. They bring back many things to be manufactured in our large towns. Some bring timber. Others are loaded with iron and copper to be smelted. Others bring cotton. A great many bring wheat.

103. Manufacturing Towns. Long ago every kind of work was done by hand. Afterwards men made simple machines which were turned by hand, or by water, or by wind. These are still used. About a hundred years ago it was found that steam could be used to drive machinery. This made the coalfields very busy places. Mills and factories were built near them, to save the expense of carrying

coal for long distances. Now electricity is being used. Electricity can be cheaply made where there is a strong current of water. Electric works are built near waterfalls, and towns grow up round them.

104. The Cleverness of Man. There is no room in this book to tell you of all the different ways in which men make the best of their lot. Some manage to live even by the frozen seas and in the hot deserts. Millions are keeping their flocks in the grass-lands. More millions are planting and reaping harvests. Millions more are sailing in ships as fishermen and traders. Many millions are working in mines and mills and factories. Millions of women are caring for babies, for the sick, and for the aged. There is no end to the world's work.

Human courage and human skill know no limit. Necessity is the mother of invention all over the world. The man with the black skin, the man with the white skin, the man with the yellow skin, none of these shrink from any danger or fatigue to get what they need for themselves and their children. In this sense all men are brothers, though their skins are of different colours.

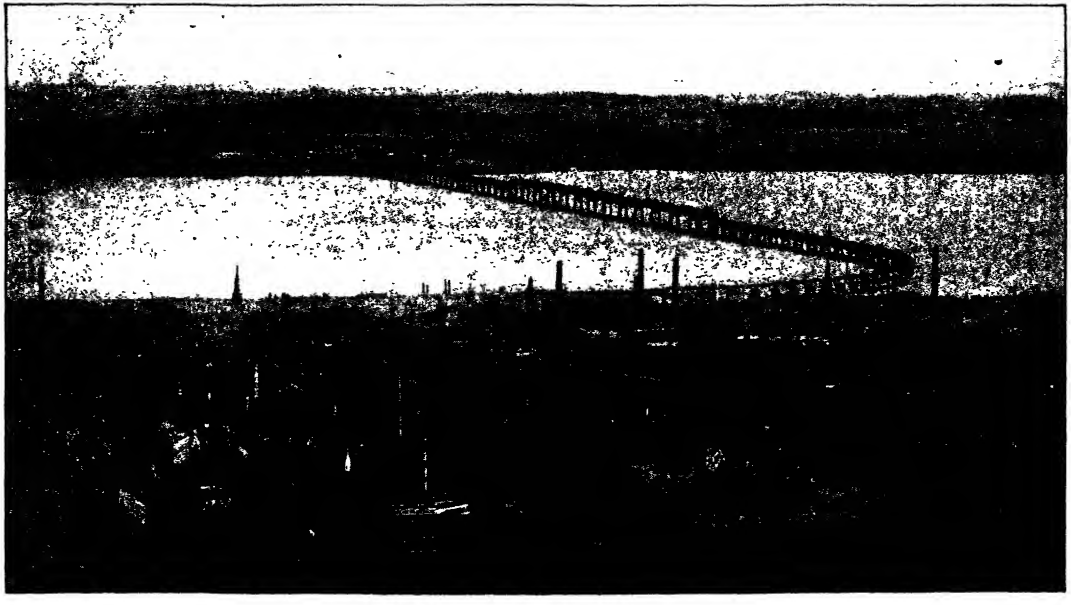

FIG. 23. A MANUFACTURING TOWN ON AN ESTUARY

The situation of the town shows that it is a port. The many chimneys show that it is a manufacturing town. A long bridge carries the railway from shore to shore. The opposite side of the estuary has no good harbours and is thinly peopled.

Exercises

1. In what ways is the life of shepherd peoples like that of hunting tribes?
2. Show that shepherd peoples can get nearly all they need from their animals.
3. In what ways are shepherd peoples better off than hunting peoples?
4. In what ways is life in the tundra of the Old World like life in the steppes of the Old World?
5. Why are agricultural peoples the most civilized?
6. What do we call the wandering people seen in our own country? Describe their homes. How do they get from place to place? How do they get food? Make a list of the things they are likely to have. Name some things they have not.

CHAPTER XII

TOWNS

105. In the last chapter we saw that men do not settle in towns till they have learned to till the soil. Then they begin to group their houses together. In this way towns begin.

Take the town you know best. There must be some reason why people first came there. One thing there must certainly be. That is water. Without that men could never have lived there. Perhaps there are springs. Perhaps there is a river. There may be a shallow place where the river can be forded. In the

days before bridges people crossed the rivers by fords. A ford is a likely place for a village or town to grow up. Oxford began in this way. Perhaps the river is narrow and can easily be bridged. Many of our older English towns grew up round bridges. London is one. Perhaps the town is at the mouth of a valley. People would stop there on their way across the hills. Derby is such a town. Perhaps sheep feed on the steep sides of the valley. The river is swift and able to turn mills. In such valleys the villages and towns manufacture wool. You find them in Scotland, in Yorkshire, and in other hilly parts of the country. Perhaps your town stands on firm ground among the marshes. Many of our older towns do. They were built there partly because the marshes defended them against attack, and also because they were on the only route across the marshes. London is such a town. Ely is another. Oxford is another. Perhaps the town is built on a high hill which cannot easily be taken. Edinburgh is such a town. Nottingham is another. Perhaps your town is built where many roads cross. If so, it was a good place for holding markets and fairs. Nearly all our old county towns are examples. Perhaps there are springs which cure diseases.

Bath is such a town. Perhaps the town is on the coast and has a good harbour. There are hundreds such round our coasts. Perhaps it is at the head of an estuary. Many of our ports are built at the highest point which good-sized vessels can reach. London is one.

Rather more than a hundred years ago men learned how to work machinery by steam. Factories were built near the coalfields. Great towns quickly grew up round them. The towns near the coalfields are the largest in the country after London. Perhaps your own town began in this way.

106. Remember that towns are not actually made. They grow. They begin as small places with only a house or two. If the position is a good one the place grows bigger. Men who want work come there and find it. The newcomers need houses, and food, and clothes. As more people settle there is more work to be had. So the place keeps on growing.

107. Whether a town remains prosperous depends on many causes. In the old coaching days many towns were important stopping-places. Horses were changed. Meals were taken. People went to the inns for a night's rest. This made such towns very busy. Then

railways were made. The journey which once took days could then be done in a few hours. People no longer stopped on the way. The old coaching towns lost their business.

Other towns go down because their trades go out of fashion. This happened to Coventry when silk ribbons went out. People left the town. Those who stayed could earn very little. Then bicycles were invented. Bicycle factories were started in Coventry. Work became plentiful once more. Trade came back. The town is now more prosperous than it ever was before.

108. Very few towns will be mentioned in these books. When a town is mentioned you must try to find out what you can about its position. This is generally what has helped to make it important.

EXERCISES

1. Why did your father go to the town in which you live?
2. What are the chief occupations in your town?
3. How do you think your own town first began?

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(*References are to pages, not sections*)

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